

Claims

We claim:

- 5 1. A direct chip attach structure comprising:
 a support substrate having a first major surface;
 an electronic chip coupled to the first major surface,
wherein the electronic chip includes a bond pad on an outer
surface;
10 a conductive stud coupled to the bond pad;
 a protective layer covering said electronic chip and a
portion of the first major surface, wherein the protective
layer has an opening to expose the conductive stud;
 a barrier layer formed on the conductive stud; and
15 a solder ball coupled to the barrier layer.
2. The structure of claim 1 wherein the barrier layer
comprises nickel.
- 20 3. The structure of claim 2 wherein the barrier layer
has a thickness of approximately 2 microns to approximately
7 microns.
4. The structure of claim 1 wherein the conductive
25 stud comprises gold.
5. The structure of claim 1 wherein the support
substrate comprises a metal lead frame having a flag.
- 30 6. The structure of claim 5 wherein the metal lead
frame and flag comprise copper.

7. A method for forming an electronic package comprising the steps of:

attaching an electronic chip to a support substrate, wherein the electronic chip includes a bond pad on an outer surface;

attaching a conductive stud to the bond pad;

encapsulating the electronic chip to form a sub-assembly having an upper surface;

forming an opening in the upper surface to expose the conductive stud;

forming a barrier layer on the conductive stud; and

attaching a solder bump to the barrier layer.

8. The method of claim 7 wherein the step of forming the barrier layer includes forming a nickel barrier layer.

9. The method of claim 7 wherein the step of forming the barrier layer comprises the steps of:

placing the sub-assembly in an electroless plating bath; and

injecting plating solution towards the opening to form the barrier layer on the conductive stud.

10. The method of claim 9 further comprising the step of agitating the electroless plating bath.

11. The method of claim 9 wherein the step of placing the sub-assembly includes placing the sub-assembly in an electroless nickel plating solution.

12. The method of claim 9 further comprising the step of masking the support substrate.

13. The method of claim 7 wherein the step of attaching the conductive stud includes attaching a gold stud.

5 14. A method for forming a direct chip attach device comprising the steps of:
 providing a sub-assembly comprising a lead frame, a chip attached the lead frame, a bond pad formed on an outer surface of the chip, a conductive bump attached to the bond
 10 pad, and an encapsulating layer covering the chip, wherein the encapsulating layer has an opening to expose the conductive bump;
 placing the sub-assembly in an electroless plating solution; and
 15 injecting electroless plating solution towards the opening to form a barrier layer on the conductive bump.

 15. The method of claim 14 further comprising the step of covering exposed portions of the lead frame with a
 20 masking layer.

 16. The method of claim 14 wherein the step of placing the sub-assembly includes placing the sub-assembly in an electroless nickel plating bath.
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 17. The method of claim 14 further comprising the step of coupling a solder bump to the barrier layer.

 18. The method of claim 14 further comprising the step
 30 of agitating the electroless plating solution.

19. A plating apparatus for forming an electronic device comprising:

5 a bath for holding a plating solution and the electronic device; and
an injecting device for directing a stream of plating solution towards the electronic device.

20. The plating apparatus of claim 19 further
10 comprising an agitating device.